Sloan Digital Sky Survey

Quarterly Progress Report
Second Quarter 2002

August 8, 2002

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1. OBSERVATION STATISTICS

1.1 Summary

In Q2, observing focused on the Northern Galactic Cap. We obtained 339 square degrees of new "unique" imaging data, or 52% of the baseline goal of 651 square degrees. We also completed 110 plates on the Northern Galactic Cap and 5 plates on the Southern Stripes, or 140% of our baseline goal of 82 plates. In addition, we re-observed 5 plates when new plates were not available because certain areas of the sky had not been imaged and targeted. The re-observed plates were chosen for a variety of reasons: two plates had low signal-to-noise data; one plate had been previously observed when we were having spectrograph focus problems; and two plates had been completed by combining exposures from different nights. While the latter produces survey-quality data, re-observing these plates in a single night provides a cross-check on plates observed on different nights.

The strong spectroscopic performance in Q2 came primarily in April, when we had many nights with only thin cirrus cloud cover. While not good for imaging, these conditions were very good for spectroscopy. In the month of April alone, we completed 61 plates and acquired ~39,000 new spectra, the best single month yield we have had so far.

Overall, the cumulative areas imaged for the Southern Survey and Southern Equatorial Survey remain ahead of the baseline and the Northern Survey remains behind. We continue to acquire imaging data at about half the rate that we anticipated when the baseline was prepared. Efficiency and system uptime were good throughout Q2, with weather continuing to be the biggest impediment to imaging progress. Poor weather prevented us from opening the enclosure on 14 of the 55 scheduled observing nights in April, May, and June. Of the 41 nights when we were able to open, there were only 13 nights with no reference to poor weather conditions (clouds, dust, wind, high humidity, etc.) in the observing logs. During the entire quarter, there were only 18 hours when conditions were suitable for imaging, compared to 35 hours predicted in the baseline.

1.2 Q1 Imaging

Table 1.1 compares the imaging data obtained in Q2 against the baseline projection.

Table 1.1. Imaging Survey Progress in Q2-2002

	Imaging Area Obtained (in Square Degrees)			
	Q2-2002		Cumulative through Q2	
	Baseline	Actual	Baseline	Actual
Northern Survey[1]	651	339	4587	3264
Southern Survey[1]	0	0	745	738
Southern Equatorial Stripe[2]	0	0	675	1028

1. "Unique" area
2. "Good minus Unique" area

We obtained 52% of the Q1 baseline goal for imaging data for the Northern Survey. As noted earlier, weather was the key limiting factor. We only managed one hour of imaging in April, eleven hours in May, and six hours in June, for a total of 18 hours compared to the 35 hours predicted in the baseline plan. Thus, although our strategy continues to be image whenever we can, we are not gaining on the baseline goals because of the limited number of hours when the weather is suitable for imaging.

The observing strategy outlined in the 5-year baseline plan consisted of completing the imaging survey in the first four years and then dedicating the fifth year solely to completing the spectroscopic survey. The time allocated for imaging in the baseline plan should have been sufficient to achieve this goal, provided we met our efficiency and uptime goals and the weather met our predictions. We are close to meeting our efficiency goal and we routinely exceed our uptime goal, but the weather has been consistently worse than we predicted. As a result, we are roughly 1300 square degrees short of our baseline goal for the Northern Galactic Cap, as of the end of June 2002.

After careful consideration, we have decided to maintain the current strategy of imaging whenever conditions are suitable through June 2005, as opposed to ending the imaging program after June 2004. By allocating time during year 5 for imaging, we will come much closer to achieving the baseline goal of 7700 square degrees on the Northern Galactic Cap, within the approved 5-year observing period and operations budget, provided the weather improves to be at least as good as historical records predict.

The following charts plot cumulative imaging progress against the baseline for each of the three surveys. Specific details regarding imaging efficiency are discussed in Section 2.5.

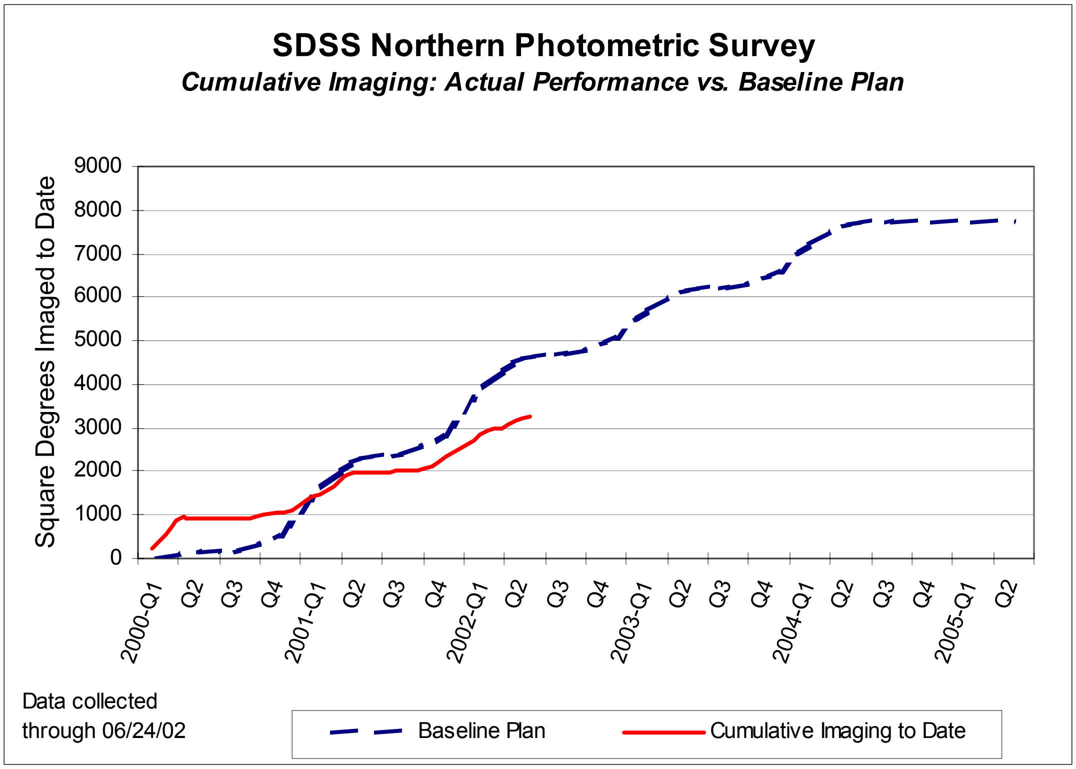

Figure 1.1. Imaging Progress against the Baseline Plan – Northern Survey

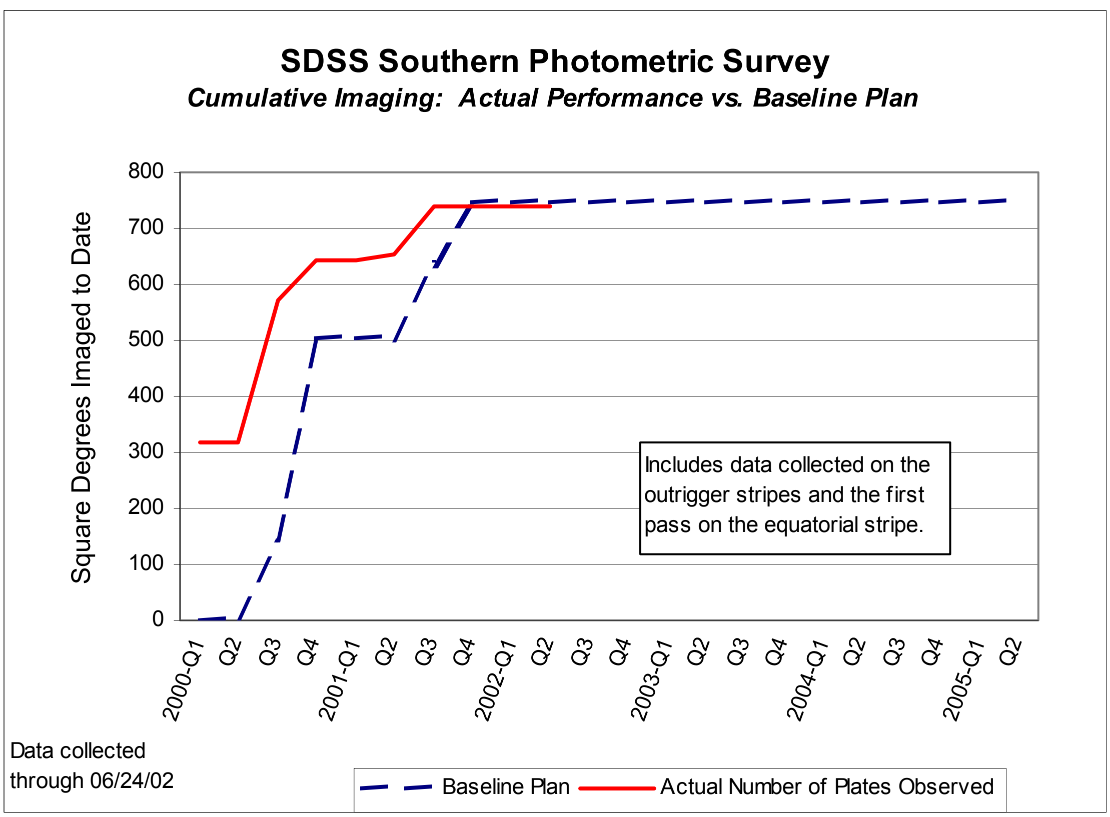

Figure 1.2. Imaging Progress against the Baseline Plan – Southern Survey

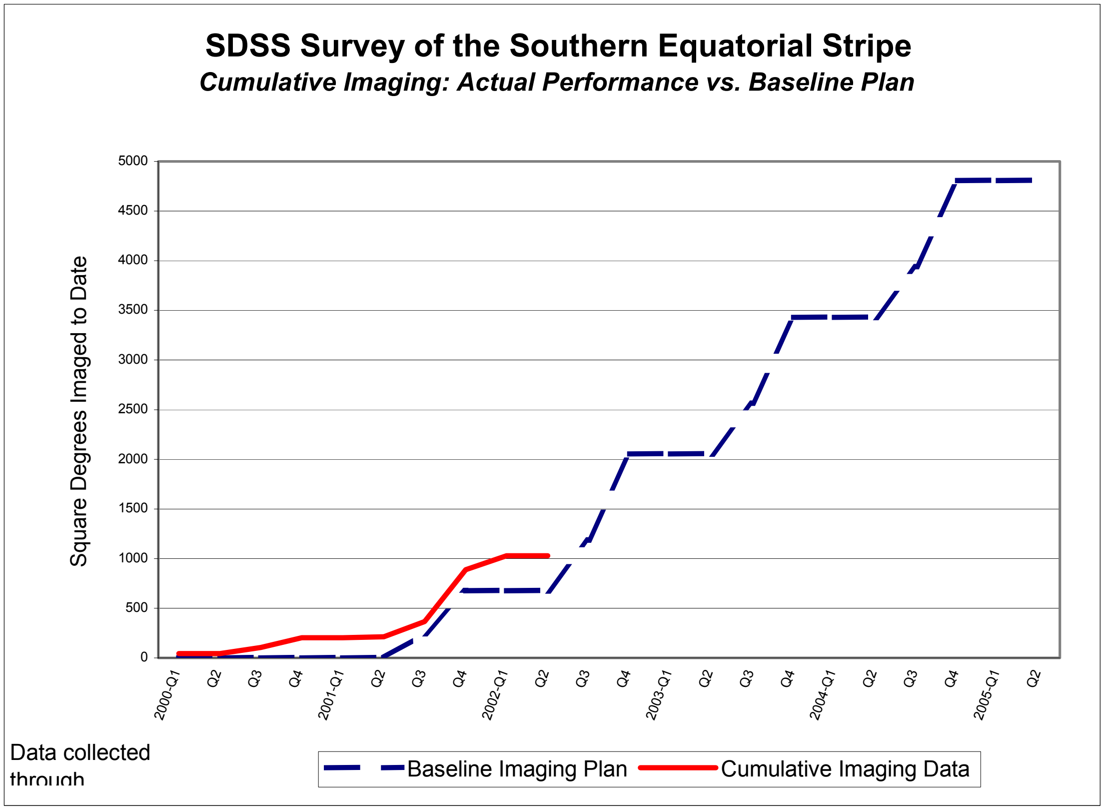

Figure 1.3. Imaging Progress against the Baseline Plan – Southern Equatorial Survey

1.3 Q1 Spectroscopy

We report progress on spectroscopy in terms of the number of plates observed and declared done during a quarter. The successful observation of a plate will typically yield 640 unique spectra. In Q2, we observed a total of 120 plates, of which 5 were repeat observations. The 115 unique plates correspond to ~73,600 new spectra and 140% of the baseline goal for Q2. Table 1.2 compares the spectroscopic data obtained in Q2 against the baseline projection.

Table 1.2. Spectroscopic Survey Progress in Q2-2002

	Number of Plates Observed			
	Q2-2002		Cumulative through Q2	
	Baseline	Actual	Baseline	Actual
North	82	110	482	428
South	0	5	148	135
Southern Equatorial	0	0	54	46
Total plates	82	115	684	609

It was mentioned earlier that we re-observed 5 plates in the quarter, due to low signal-to-noise, marginal focus, and cross-checking observations taken on different nights. While not contributing to the baseline goals for new survey quality spectra, the repeat observations improve data quality and provide quality assurance checks.

The following charts plot cumulative spectroscopic progress against the baseline for each of the survey areas. Spectroscopic efficiency is discussed in Section 2.6.

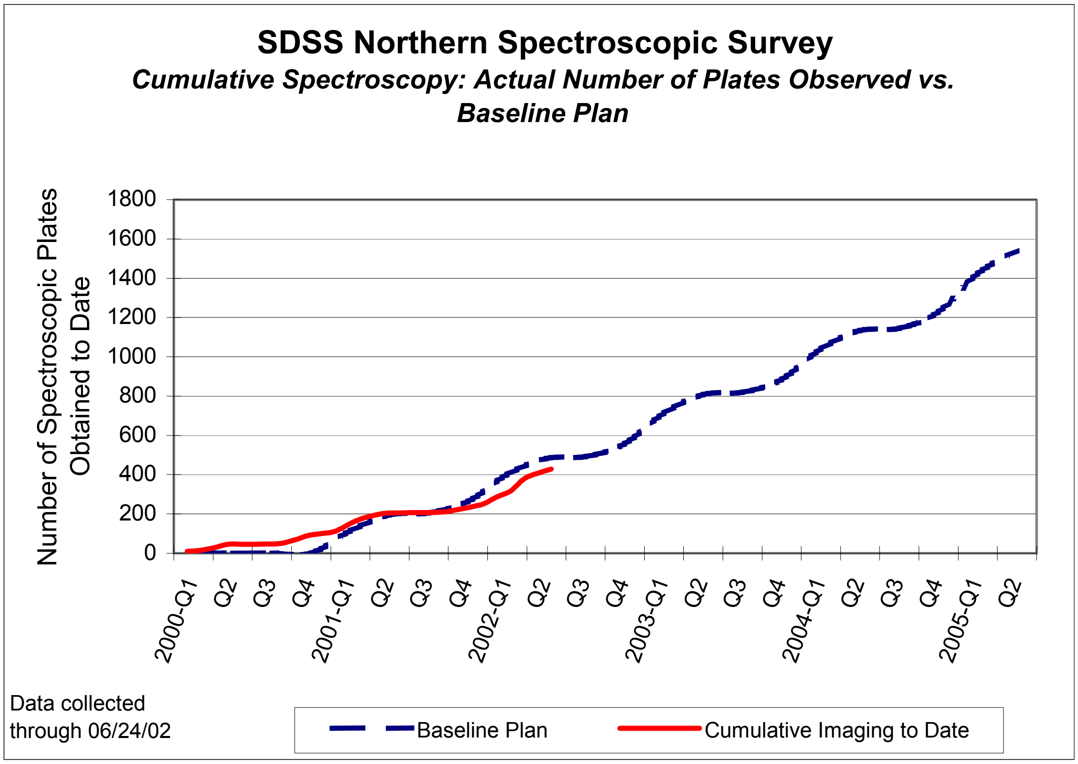

Figure 1.4. Spectroscopic Progress against the Baseline Plan – Northern Survey

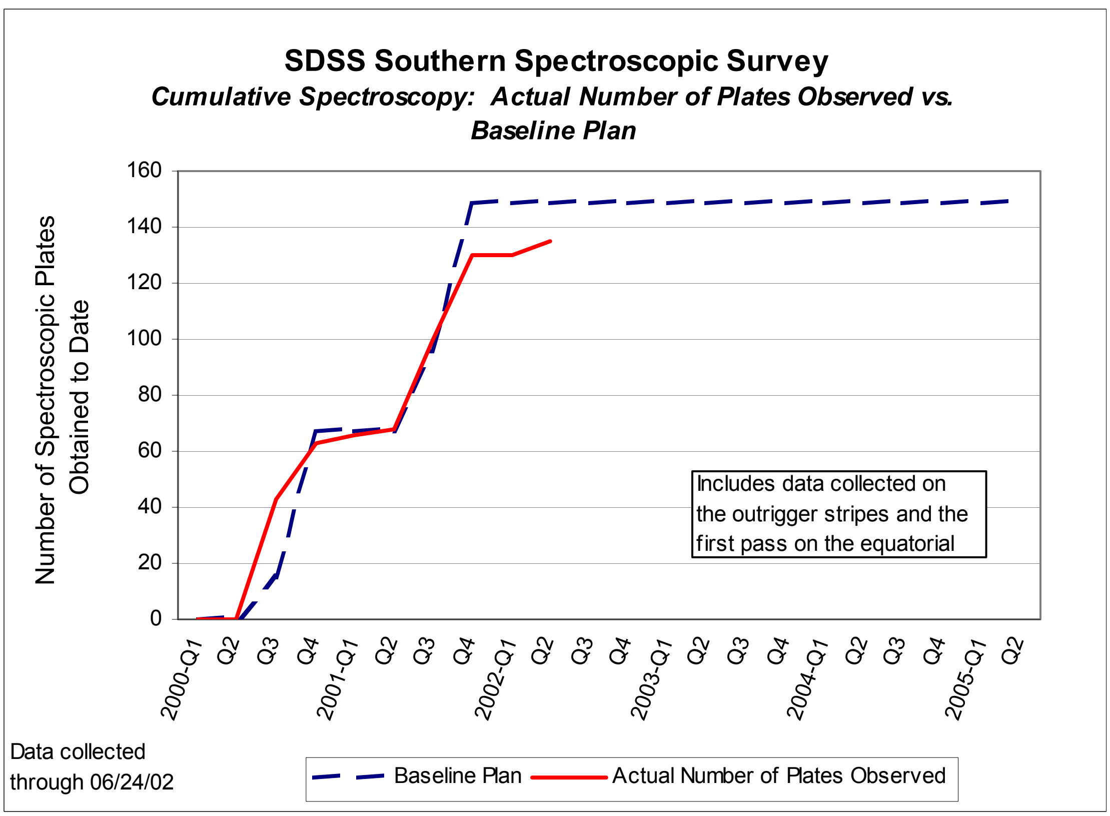

Figure 1.5. Spectroscopic Progress against the Baseline Plan – Southern Survey

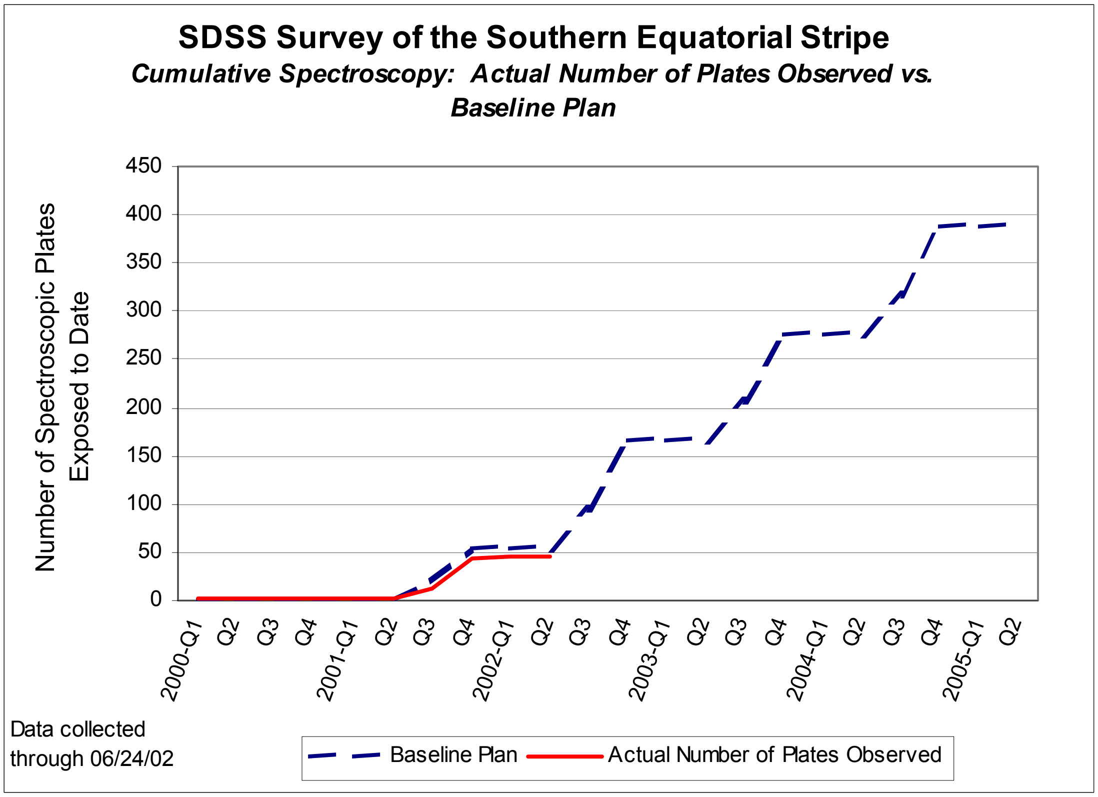

Figure 1.6. Spectroscopic Progress against the Baseline Plan – Southern Equatorial Survey

1.4 Status of Photometric Telescope Secondary Patches

A summary of the PT patches that have been observed and classified through the end of Q2 is shown in Table 1.4.

Table 1.4. Summary of Unique Secondary Patches Progress in Q2-2002

	Cumulative through Q2
Unique Patches	
“Done, verified”	1063
“Done, not verified”	12
Old patches available	36
Total Patches Done	1111
Total number required	1582
Percent observed (exclusive of old patches)	70%

The categories used in Table 1.4 are defined as follows. Unique Patches consist of the number of patches under the current patch layout system that have been successfully observed. This criterion is analogous to the “unique” criteria for imaging data. Patches classified as “Done, verified” have been successfully observed at APO and their quality verified after data processing at Fermilab. Patches classified as “Done, not verified” have been observed and declared “good” at APO, but they still require data processing confirmation. There are currently 12 patches in this category. There are also 36 patches that were observed earlier, but that need to be re-observed under the current layout scheme. These patches are of sufficiently good quality, and their positions close enough to that in the current layout, that re-observing these patches has been given lower priority relative to observing new patches. These patches are classified as "Old patches available." "Total Patches Done" is simply the sum of these three categories. It is also the total number of patches that have been observed since the PT baffling was improved and a contaminating film removed from the CCD surface.

The fraction of sky over which we have obtained good patches is greater than the fraction of sky that we have successfully imaged. In fact, all areas that have been imaged with the 2.5 m telescope have had at least one set of patches successfully observed, and we have observed patches for most of the area scheduled for imaging in the immediate future. The remaining patches will be observed when available with a higher priority than other unobserved patches.

We are currently reprocessing all of the PT data obtained to date and identifying patches for which the existing data are marginal. The status of these patches is being set to "undone" and they will go back into the queue to be re-observed. In addition, we plan to obtain additional patches for scans that have been covered by only one set of patches. These steps will significantly improve the photometric accuracy of the imaging data in hand at a small cost in PT observing time. They will also cause the statistics on the number of patches reported in Table 1.4 to fluctuate from one quarter to the next.

2. OBSERVING EFFICIENCY

2.1. Overview of Observing Efficiency in Q2

Table 2.1 summarizes the breakdown of observing time in Q2-2002 according to the categories used to prepare the baseline projection.

Table 2.1. Comparison of Q2-2002 Efficiency Measures to the Baseline

		April		May		June	
Category	Baseline	Dark	Dark+gray	Dark	Dark+gray	Dark	Dark+gray
Total time (hrs)	Apr: 123:40 May: 100:11 Jun: 92:34	123:40	157:59	100:11	136:45	92:34	121:17
Imaging fraction	0.27	0.02	0.02	0.22	0.16	0.15	0.12
Spectro fraction	0.63	0.93	0.93	0.74	0.78	0.76	0.81
Weather	0.60	0.64	0.57	0.53	0.59	0.52	0.57
Uptime	0.90	0.99	0.99	0.90	0.93	0.98	0.97
Imaging efficiency	0.86	0.00	0.00	0.83	0.83	0.84	0.84
Spectro efficiency	0.65	0.63	0.65	0.63	0.64	0.58	0.65
Operations efficiency	0.90	0.95	0.95	0.97	0.95	0.92	0.92

2.2. Allocation of Time between Imaging and Spectroscopic Operations

The fraction of time reported for imaging and spectroscopic operations includes actual observing time and overhead. Actual observing time in one mode or the other is straightforward to measure, whereas measuring the overhead is difficult. The 5-year Baseline Plan distinctly divided overhead between imaging and spectroscopy. In practice, this division is somewhat arbitrary given the manner in which observing activities occur. Since we cannot accurately measure overhead in the same manner defined in the Baseline Plan, we have derived a set of measurable time allocation metrics from the baseline goals. These derived metrics are shown in the baseline column in Table 2.1.

In practice, weather dictates the allocation of science time between imaging and spectroscopy. Whenever the weather is suitable for imaging, we image. As a consequence, the numbers we report represent the fraction of potential observing time that the weather was suitable for imaging. Since we need to acquire as much imaging data as possible, spectro fractions below the baseline do not indicate poor performance. They indicate that we are allocating as much time to imaging as conditions permit.

In Q2, the fraction of time allocated to imaging was significantly lower than the baseline in April, slightly below the baseline in May, and far short of the baseline in June. In the nineteen scheduled observing nights in April, for example, conditions allowed only one hour of imaging, so nearly all of April was allocated to spectroscopy. May and June were only slightly better.

2.3. Weather

The weather category represents the fraction of scheduled observing time when the weather is suitable for observing. The baseline plan assumed that when the weather was good enough to have the telescope on the sky, it was also good enough to complete a spectroscopic plate in 45 minutes of exposure time. In reality, we are able to take useful spectroscopic data when the weather is much worse, by taking longer exposures to achieve the required signal-to-noise ratio. However, the time tracker considers all of the time that useful data can be taken as good weather, the weather fraction we measure is not directly comparable to the baseline.

In effect, the weather fraction reported by the time-tracker is an upper limit on the number that should be compared to the baseline, since it overstates how good the weather was. If an estimated correction based on the number of plates completed is made, the weather fraction for dark + gray time for April, May, and June becomes 0.52, 0.52, and 0.50 respectively.

Overall, there were only 4 fewer hours of useful weather during dark time in Q2 than specified by the baseline. This is due mainly to the fact that the weather in April was better than the baseline expectation (64% vs. 60% in the baseline). We also picked up an additional 60 hours of spectroscopic observing during "gray" time over the entire quarter. While significantly increasing the total number of spectroscopic observing hours, the gain is offset because spectro efficiency during gray time, or through clouds, is significantly less than in "good" weather. The impact of this reduced efficiency in Q2 is illustrated as follows: In the 122 hours of science exposures taken, we completed 120 plates. Had these exposures been taken under good weather conditions and no moon (as assumed in the baseline), we would have completed them in 90 hours of exposure time (45 minute exposure per plate x 120 plates). This shows that an additional 32 hours of exposure time were needed to complete these plates because we observed in marginal weather and/or moonlight conditions.

Table 1.3. Breakdown of Weather Conditions in Q2 2002

Period	Scheduled observing nights	Nights when weather prevented opening	Nights when weather limited observing hours
April	19	4	9
May	18	5	8
June	18	5	9

Figure 2.1 compares the fraction of dark time that the weather was suitable for observing at APO against the baseline weather assumption. The trend chart begins in August 2001, when we implemented our new time tracking tools, and clearly illustrates the length of time that we have operated with sub-optimal weather conditions. As previously noted, we have been able to offset some of the lost time by conducting spectroscopic observations during gray time, but this does nothing to help us catch up on imaging data.

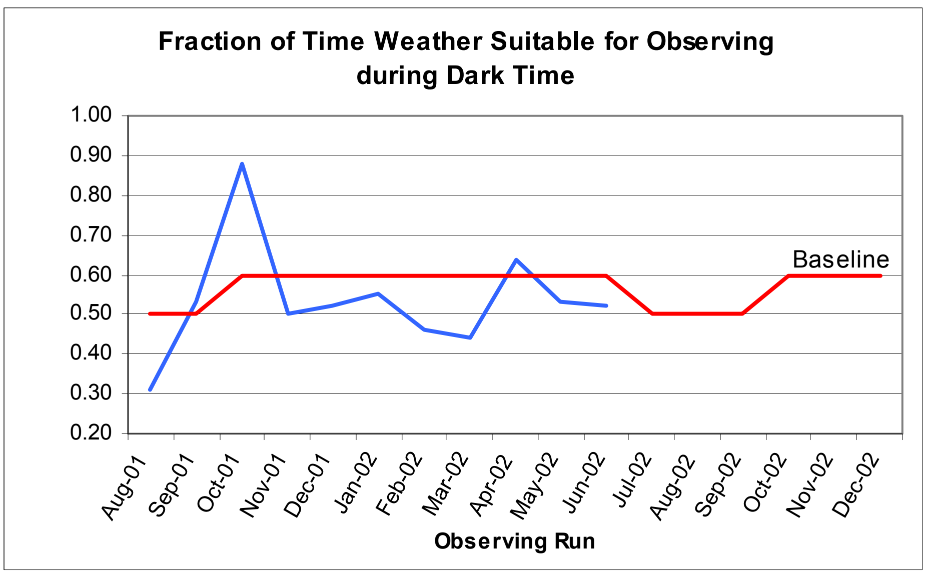

Figure 2.1. Comparison of the fraction of time that the weather was suitable for observing during dark time, compared to the 5-Year Baseline Plan.

2.4. System Uptime

System uptime is a measure of equipment availability when conditions are suitable for observing. Figure 2.2 shows system uptime for each observing run since August 2001. The number measured by the time-tracker is directly comparable to the number specified in the baseline. Although we experienced a number of minor equipment problems in Q2, we still exceeded the uptime goal of 90% for each observing run of the quarter. We achieved 99% uptime in April and 98% uptime in June. Uptime in May dipped to 90% due to a procedural error and a hung computer process. A fill hose was connected to the vent line of a liquid nitrogen dewar instead of the fill line, which led to a spectrograph warm-up; the hung computer process took several hours to troubleshoot.

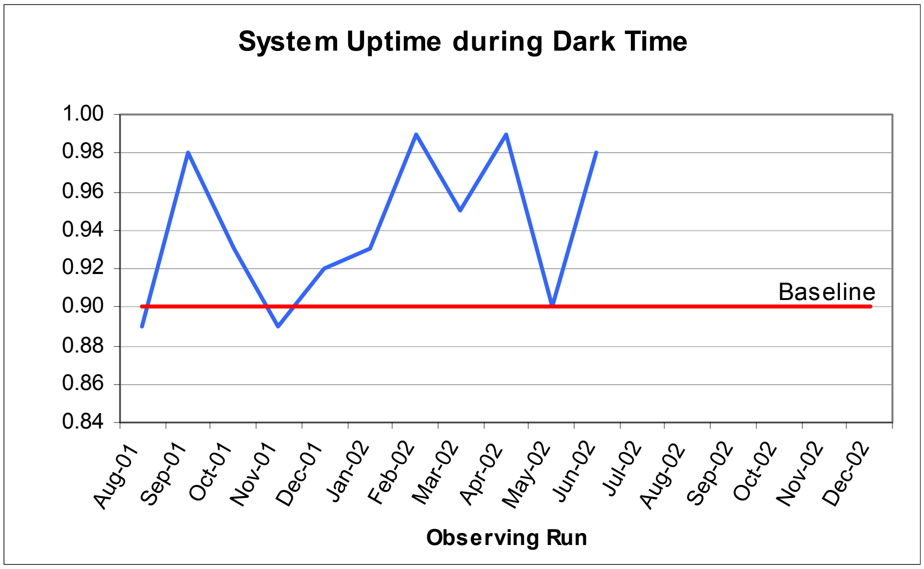

Figure 2.2. System Uptime During Observing Periods

2.5. Imaging Efficiency

Figure 2.3 shows the improvement in imaging efficiency since August 2001. The dip in April is due to the fact that we only acquired one hour of imaging data during that month. Although the observers completed the setup for the one-hour run in the minimal time possible, the measured efficiency takes a hit because the minimal setup time (16 minutes) is a significant fraction of the overall time for short imaging scans. This was also case in May and June, when numerous short scans caused the efficiency to remain below the baseline. The baseline assumed that imaging scans would be ~2.9 hours long, so shorter scans inevitably result in measured efficiencies below the baseline. Although less efficient, we are often forced to take short scans in our pursuit to acquire imaging data whenever conditions permit or to fill in areas for target selection.

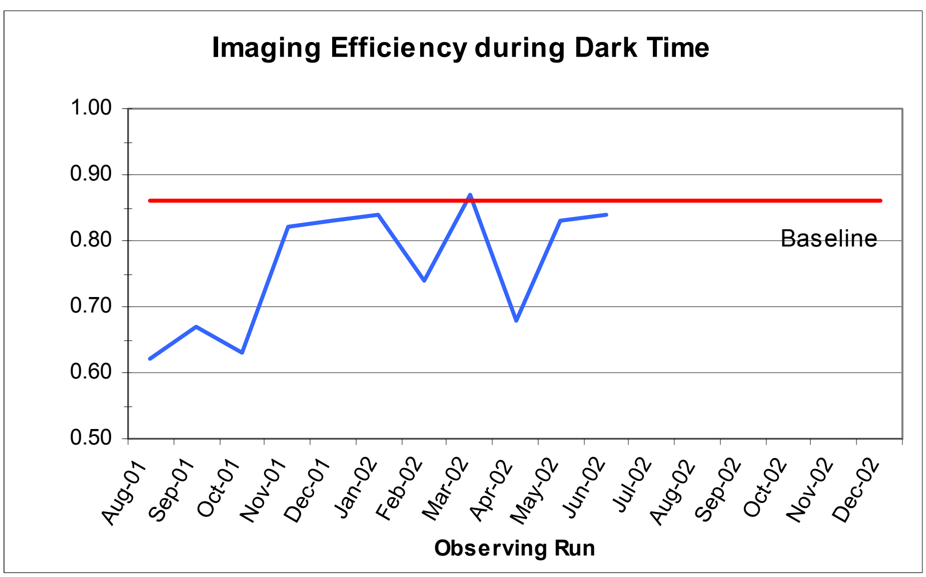

Figure 2.3. Imaging Efficiency during Observing Periods

In addition to trending efficiency, we use two simple statistics from our time tracking data to measure imaging efficiency: the imaging efficiency ratio and the imaging effectiveness ratio. The first, a measure of observing efficiency, is the ratio of science imaging time to the sum of science imaging time plus imaging setup time. The second, a measure of how effectively we use available imaging time to acquire new survey quality data, is the ratio of imaging area obtained to the science imaging time.

The baseline plan established the imaging efficiency ratio to be 0.86. In Q2, our measured efficiency ratio was 0.83, the same as it was for Q1. The monthly imaging efficiency ratios for Q2 are shown in Table 2.2.

Table 2.2. Imaging Efficiency Ratios for Q2-2002

	April	May	June	Aggregate
Imaging Efficiency Ratio	0.68	0.84	0.84	0.83
Baseline	0.86	0.86	0.86	0.86
Efficiency relative to baseline	79%	98%	98%	97%

In addition to an overall improvement in the efficiency ratio, we achieved an improvement in the imaging effectiveness ratio. In Q1, our measured effectiveness ratio was 17.6 square degrees/hour. In Q2, the sum of the imaging area obtained in Q1 (339 square degrees) divided by the time expended on science imaging (18.2 hours) was 18.6 square degrees/hour. This is the first time that we have met the baseline goal of 18.6 square degrees per hour and indicates that all of the area imaged met survey requirements and contributed to the survey goals. Accordingly, the imaging effectiveness ratio was 100% for Q2, compared to 95% for Q1 and 83% for 2001-Q4.

The product of the efficiency and effectiveness ratios is 97%, which indicates a performance improvement for the third quarter in a row, since we achieved a 92% ratio in Q1 and a 76% ratio in 2001-Q4.

2.6. Spectroscopic Efficiency

During Q2, the total time spent making spectroscopic observations, after excluding the time for cartridge changes, setup, and calibration, was 122 hours, compared to the baseline expectation of 61 hours. The difference is due in large part to the fact that nearly all available observing time in April was allocated to spectroscopy, and that spectroscopic observing is often done in less than ideal weather conditions and during gray time. Gray time was not included in the baseline plan because we were not certain that such observations would produce survey quality data.

The mean time expended in Q2 to obtain survey quality spectra for a plate was 61 minutes, whereas the baseline allocates only 45 minutes. Comparing the mean time per plate to the baseline is not a practical performance indicator, however, because in addition to observing efficiency, the measured mean includes the effects of weather, moonlight, and the longer observing times required for special plates. A better method of determining our efficiency is to extract from the time-tracking records the median overhead per plate mounting, and then calculate the efficiency this overhead would correspond to under good weather conditions. In

Q2, this results in an achieved efficiency of 0.60, which is an improvement over the achieved efficiency of 0.57 of Q1 but is still below the baseline goal of 0.64.

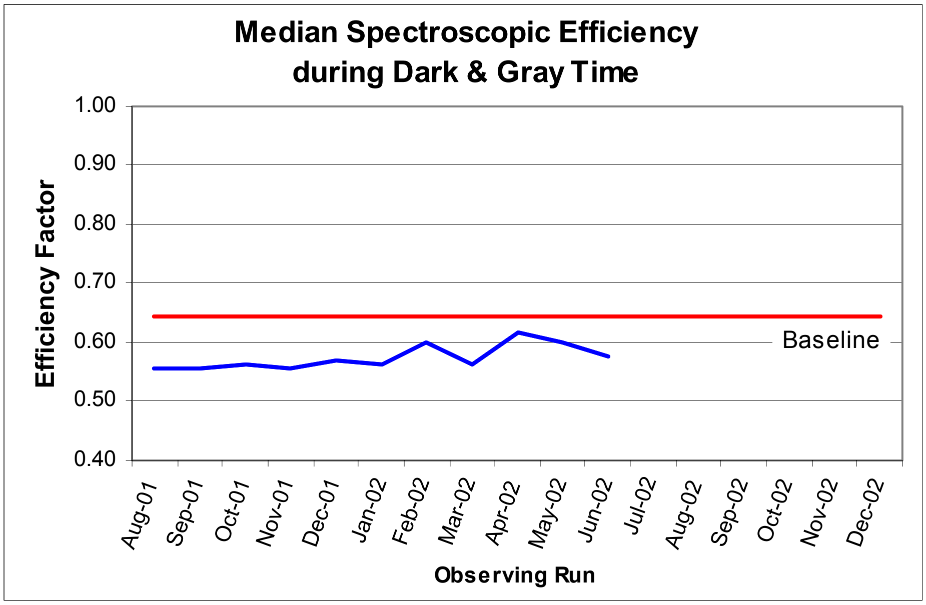

Figure 2.4. Spectroscopic Efficiency during Observing Periods

An additional performance indicator is to compare the median time spent on the various aspects of spectroscopic operations against the baseline goals. By analyzing only those plate mountings in which there were no reported weather or equipment delays during the entire set of observations, we are able to measure operating performance and exclude the impact of factors beyond our control, such as weather and moonlight. Table 2.3 provides the median time, by month, for the various elements of spectroscopic time. Units for all categories are minutes except for efficiency, which is given as the ratio of science exposure time to total time required per plate.

Table 2.3. Median Time for Spectroscopic Observing Activities Over the Last Two Quarters

Category	Baseline	Jan	Feb	Mar	Apr	May	Jun
Cartridge change	10	6	5	5	5	5	5
Setup	10	12	10	12	8	10	13
Calibration	5	14	12	15	12	12	12
CCD readout	0	3	3	3	3	3	3
Total overhead	25	35	30	35	28	30	33
Science exposure (assumed)	45	45	45	45	45	45	45
Total time per plate	70	80	75	80	73	75	78
Efficiency	0.64	0.56	0.60	0.56	0.62	0.60	0.58

We maintained the cartridge change and calibration times throughout Q2 and in April, achieved the lowest median setup time to date. This was due to reasonably good spectroscopic conditions which allowed us to quickly acquire fields and verify telescope focus. The median setup times recorded for May and June are in line with those we typically achieve when observing through marginal conditions.

In Q2, we modified our spectro calibration procedure to take "pre-calibs" after the first science exposure. In the past, "pre-calibs" were always completed prior to the first exposure. If a plate is completed in three relatively short exposures (e.g, 15-20 minutes per exposure), or if the site conditions are not changing, then pre-calibs were usually sufficient to calibrate the plate. However, if exposure times are long due to cloudy and/or moony conditions, or if a plate is started on one night and finished on another, then post-calibs are needed. Post-calibs significantly increase overall calibration time and the more post-calibs required, the larger the median calibration time. By moving the calibration closer to the middle of the exposure sequence, we have reduced the number of post-calibs needed. The median calibration time for each run in Q2 was 12 minutes, which is the best we've done to date and is likely to be the best that we can do.

The baseline allowed 5 minutes per plate for calibration, which is approximately the time required to take arc lamp and flat field calibrations. The baseline did not include the 5 minutes required for spectrophotometric calibrations ("smears") nor the 3 minutes required for CCD readout time. These sum to 13 minutes, so the fact that we're achieving 12 minute calibration times is in fact very good. Since it is unlikely that we can reduce calibration time further, we have begun to look at other areas where we may be able reduce operation time. One such area is improved guiding.

Preliminary indications are that we are not guiding as accurately as we could be, which means that not all of the light from stars, galaxies, etc. is falling squarely on the optical science fibers. A guiding error would be a systematic effect that would appear as poor $(\text{signal-to-noise})^2$ per second across a plate, which would be compensated for through longer exposures. We estimate that the efficiency hit from a guiding error of 0.75 arcsec is ~35% of $(S/N)^2$ per unit time in 2 arcsec seeing, so reducing the guiding error has the potential to reduce exposure time, especially on the long exposures required when weather conditions are marginal. We are currently reviewing options to improve the guiding system.

2.7 Summary of Efficiency Observations

In summary, weather was once again worse than predicted throughout the quarter. Equipment availability met or exceeded baseline goals. Earlier improvements in imaging efficiency continue to pay dividends, as imaging efficiency in Q2 was consistently higher than in the past when the effects of short imaging scans are considered. Spectroscopic efficiency remains below the baseline.

3. OBSERVING SYSTEMS

In Q2, we had a couple of minor instrument and software problems, we completed the thermal environment work, and we worked hard on a number of planned engineering tasks.

3.1. The Instruments

Although overall performance was good, we did experience a few minor problems with the instruments in Q2. There is an intermittent problem in the imaging camera LN2 auto fill system that causes the system to occasionally take a very long time to refill. While we have known about the problem for some time, it began to occur more frequently in Q2 and so we have raised the priority on getting it fixed. Troubleshooting and repairing the auto fill system is on the imager summer shutdown task list.

We experienced periodic computer communication problems with the spectrograph mechanical systems. The software code that communicates with the spectrographs has been reviewed and several code modifications made to fix several potentially troublesome areas. The code will be installed and tested during the summer shutdown.

Finally, a bad column appeared in the guider camera CCD in Q2. Since the bad column goes through the area where guide fiber output lands on the CCD, the bad column has the potential to contribute to guider error by confusing the centroiding algorithm. The CCD will be looked at during the summer shutdown.

3.2. Thermal Work

In Q1, we finished the conceptual design work and finalized the plan for installing louvers in the lower level of the 2.5-m telescope enclosure. In Q2, the louvers were installed and brought into operation. The louvers will reduce the temperature in the lower level by allowing cool outside air to enter and flow through the lower level when the large exhaust fan is operated. With the installation of the louvers, all planned thermal improvement projects are complete.

3.3. The Photometric Telescope

There were no significant problems with the Photometric Telescope (PT) during Q2. There were occasional nuisance problems with the PT filter-wheel controller that have been with us for some time. A proposal for a commercially available control board was recently approved and will be ordered for installation during the September bright time. It was originally scheduled for installation during the summer shutdown, but given the extensive shutdown work list, the decision was made to postpone this work until early fall.

3.4. Operations Software

During Q2, we experienced a few minor problems with the observing software. The most notable occurred when we lost several hours one night due to a hung computer process. After exhausting known recovery procedures, the observers called one of the software developers who found and terminated the hung process. Recovery procedures were updated accordingly.

We also implemented a number of necessary improvements. In the Q1 report, we noted that an improved algorithm associated with quartiling in the astroline software was undergoing revision and testing. The new algorithm was designed to reduce imaging setup time by improving the response of astroline to abrupt changes in ambient light level, such as near twilight, at the beginning of runs when the shutters are opened, and on "moony" nights. The algorithm was successfully tested and implemented in Q2.

In the Q1 report, we reported a problem with the spectrophotometric calibration process (aka “smears”) that was largely related to communication issues between the Spectroscopic Observers’ Program (SOP) and the Telescope Control Computer (TCC). A temporary modification was made in SOP near the end of Q1 to monitor proper execution of commands. Using this information, we were able to modify the TCC code to improve the communication and execution of commands from SOP. The change was tested and implemented in Q2 and we have not seen any recurrence of the smear problems.

Finally, to review long-term needs and develop an achievable work plan and development schedule, an Observing Software planning meeting was held at Princeton in May 2002. Attendees include software developers, the Lead Observer, the Project Scientist, and the Project Manager. The goal of the meeting was to identify those problems that need to be fixed to improve data quality or observing efficiency from the long list of problems that were reported during operations. A list of approved tasks was developed through the use of the GNATS Problem-Reporting Database, with most items scheduled for completion over the summer 2002 shutdown. Beyond the shutdown, no significant changes are planned. All work on observing software after the summer shutdown will be focused on fixing only high priority bugs and addressing new critical problems that arise.

3.5. Status of Engineering Tasks Scheduled for Q2

Table 3.1 reports the status of the more significant engineering tasks that were scheduled for completion in Q2-2002. Tasks marked with asterisks were carry-over tasks from Q1.

Table 3.1. Status of Engineering Tasks Scheduled for Q2-2002

Task	Responsible	Driver	Priority	Status
Finish emergency closing generator system*	Leger	Equip prot.	High	100%
Finish M2 actuator bellows upgrade	Carey	Reliability	High	100%
Enclosure lower-level louvers	Klaene	Data quality	High	100%
Test and debug instrument change interlocks*	Anderson	Equip prot.	High	90%
Finish PM program for telescope systems*	Leger	Reliability	High	70%
Design, fabricate, install encl. stair upgrade*	Carey	Safety	High	60%
AZ fiducial read-head mount upgrade	Leger	Reliability	High	50%
Finish imager LED calibration system	Gunn	Data quality	Medium	100%
Finish detailed design work for DIMM mount	Gunn	Efficiency	Medium	100%
Finish implementation of slip detection system*	Czarapata	Equip prot.	Medium	95%
Fabrication/assembly of new Cloud Camera	Gunn	Reliability	Medium	50%
Design / fabricate M2 aluminizing fixture	Carey	Data quality	Medium	90%
Design / fabricate plug plate drilling fixture	Carey	Efficiency	Medium	0%

Regarding the tasks listed in Table 3.1, the status of the incomplete tasks is as follows:

- The interlock instrument change PLC code underwent testing and minor code improvements. Testing the instrument change interlocks did not hamper observing operations and will continue through the summer.
- The preventive maintenance program for the telescopes remains under development. We added additional PM items to the list in Q2, but the task remains open because we have yet to complete a comprehensive review to identify all areas requiring preventive maintenance. We will strive to complete this during 2002.
- Significant progress was made on the detailed design work for the new 2.5m telescope enclosure stair system. During Q2, we iterated on several design details and agreed on

the final system design. Detailed design work is now underway and component procurement and fabrication will occur in late summer. However, given the heavy summer shutdown work list and vacation schedules, we do not anticipate installing the new stair system until the September bright time.

- The latch circuit for the slip detection system was installed and the slip detection / TPM interface successfully tested in Q2. We are currently logging reported slips and manually documenting system resets to understand how accurately the system is working before implementing it during observing operations. We may have to adjust slip detection thresholds to ensure adequate protection while avoiding false trips that abort telescope drive motors. We plan to fine-tune the system during the summer shutdown, in order to have the system fully operational at the start of the fall observing season.
- We held the final design review for the DIMM telescope mount in May; approval to proceed was given and orders placed for component machining. Parts will be fabricated during the summer, but given an extensive shutdown maintenance list, we do not plan to install the DIMM until the September 2002 bright time.
- The final design for the Cloud Camera upgrade was reviewed and approved. Parts fabrication is underway and all procurements have been received. The new Cloud Camera is scheduled for installation at APO during the summer shutdown.
- A new aluminizing fixture is required to hold the secondary mirror (M2) in the Sunspot aluminizing chamber in such as way as to allow us to aluminize both the front and rear faces of the mirror. Aluminizing the rear face replaces the aluminum foil that is currently wrapped on the glass surface. Fabrication is underway, with the fixture due at APO mid-July; the secondary mirror is scheduled for aluminizing on July 22.

3.6. Engineering Tasks Scheduled for Q3-2002

Table 3.2 lists the more significant engineering tasks scheduled for completion in the third quarter of 2002. Tasks marked with asterisks are carry-over tasks from Q2-2002.

Table 3.2. Engineering Tasks Scheduled for Q3-2002

Task	Responsible	Driver	Priority
PM program for telescope systems*	Leger	Reliability	High
Finish testing instrument change interlocks*	Anderson	Equip prot.	High
Design, fabricate, install encl. stair upgrade*	Carey	Safety	High
Fabricate AZ fiducial read-head mount upgrade*	Leger	Reliability	High
Aluminize secondary and primary mirrors	Leger	Data quality	High
Annual imaging camera maintenance work	Gunn	Data quality / reliability	High
Annual summer shutdown maintenance work	Leger	Reliability	High
Finish implementation of slip detection system*	Czarapata	Equip prot.	Medium
Install new Cloud Camera*	Gunn	Reliability	Medium
Install DIMM telescope*	Gunn	Efficiency	Medium
Develop plan for guider replacement	Gunn	Efficiency	Medium
Design and fabricate plug plate drilling fixture*	Carey	Efficiency	Medium

An engineering planning meeting was held in May 2002 to review performance against the plan developed in December 2001 and develop the revised plan for the remainder of the year. The meeting also provided an opportunity to review in detail the work planned for the summer 2002 shutdown. The number of major tasks is diminishing rapidly and effort is shifting to preventive maintenance and system improvement to improve reliability and ensure uptime. Major remaining projects include the DIMM installation, cloud camera upgrade, guider upgrade, plug plate drilling fixture upgrade, and counterweight upgrade. This is a substantially reduced list from that generated at the December 2001 planning meeting.

3.7 APO Site Improvements

Installation of new double-wide office trailers for the observing and engineering groups at APO began in Q2. Site preparations were completed on schedule and with little problem. Delivery and installation of the trailers has been quite challenging due to a number of minor but frustrating problems. Nonetheless, we are working through the various issues and anticipate that both groups will be moved in by the end of July. The new office areas are much larger than what we had previously and will provide a much better work space at APO.

4. DATA PROCESSING AND DISTRIBUTION

Data processing operations went smoothly throughout Q2, with all of the newly acquired data promptly processed and stored into the operations database for access by the collaboration. The data processing operation routinely processes new imaging data within 2-3 days and spectroscopic data within 24 hours.

Work continued on the development of the pipelines and databases that will be used for Data Release 1 (DR1), which is scheduled for January 1, 2003. A significant effort went into developing, testing and debugging the new imaging (Photo v5_3) and spectroscopic pipelines (idlspec2D v4_9 and Spectro1D v5_7). Much effort also went into developing the software code and tools necessary to load the DR1 dataset into the Microsoft SQL Server database planned for DR1. While we put significant effort into DR1 preparations in Q2, we nonetheless fell behind schedule. We are working very hard to understand where we can focus resources to recover some of the lost time. Details are provided below.

4.1. Data Processing

4.1.1. Data Processing Operations in Q2

All imaging and spectroscopic data collected through the end of Q2 have been processed with Photo v5_2_26, idlSpec2D v4_8_2, and Spectro1D v5_4_5. Plate designs were delivered on schedule for the April, May, and June drilling runs.

With regard to hardware, the disk servers are performing reasonably well with only minimal problems experienced in Q2. We experienced disk failures on four out of 234 IDE disks, but the RAID system prevented any data loss. A power supply failure corrupted data on one system, but we restored the files from tape backups.

We continue to improve operational efficiency in the data processing factory, where we typically have a dozen imaging runs in progress. Runs may be in various stages of processing, waiting for calibration patches to be observed, or waiting for problem reports (PRs) to be addressed. The factory was used for extensive testing of the Photo v5_3 pipelines as part of the development and validation process.

The following items summarize our progress in achieving the data processing goals for Q1.

1. Have the DR1 versions of all pipelines delivered and tested.
   - We did not meet this goal because it is taking longer than anticipated to complete the development and validation of the Photo v5_3 pipeline. The test suite of data for DR1 has been processed and a number of problems in Photo v5_3 identified and fixed, but there are still a few remaining problems that are being actively addressed. The spectro pipelines (idlspec2D v 4_9 and spectro1D v5_7) have been delivered and tested.

2. Have all DR1 data processed with these pipelines.
   - Spectro data has been processed, but imaging processing is pending the completion and final validation of Photo v5_3. Details are provided in section 4.1.2.

3. Have SQL Server databases, with imaging, spectro, tiling, and mask schemas loaded and available to the collaboration for testing.
   - Database development is still on-going, with details provided in section 4.2.2 .

4. Continue routine processing of data, especially to design plates for each tiling run.
   - We met the schedule for the three plate runs this quarter and are current will all processing.

5. Have data processing automated and demonstrate that one FTE equivalent can run routine imaging and spectro processing, not including target/tile/plate and database stuffing operations.
   - Although we made some progress in this area, there is still work to do. It is difficult to estimate the exact manpower required for routine processing since the bulk of the data processing factory effort in Q2 was spent supporting the development of Photo V5_3 and working with the database developers to implement the new SQL databases. We will have a better feel for the level of effort required, and where improvements can be made, once we start the full DR1 reprocessing. We expect this to occur in late summer.

4.1.2. Pipeline and QA Development in Q1

A variety of serious bugs were identified and fixed in Photo 5_3 (SSC, PSP, and opdbQA), the code that will be used to process imaging data for Data Release 1. These bugs had to do with the determination of the PSF, especially in regions where the PSF was changing dramatically. Improvements were also made to PSP's speed and memory usage. The software developers at Princeton worked closely with the data processing group at Fermilab to test Photo v5_3 on the production machines, and delivered an essentially working version by early June. Since then, the code has gone through a number of iterations in response to a variety of small bugs having to do with such things as incorrect handling of cosmic rays in superb seeing. We are guardedly optimistic that the final round of code changes are now being made and that testing and final approval to begin DR1 data processing will occur in late summer.

Work was done to understand and develop accurate flat-fields for the imaging data. It was found that the flats show systematic changes over time, especially in the u-band. We have correlated these systematic changes to the times when the imaging camera was opened up for maintenance and repair. We now refer to the periods between camera repairs as "seasons" and have identified six major seasons in the SDSS imaging data. Preliminary flat fields were derived for each season and tested against Photo v5_3 outputs, and it was learned that minor adjustments are needed. Tweaking and testing of the flat-fields is currently underway.

Minor improvements were made to the OPDB QA tools, which check the integrity of the imaging pipeline reductions. These QA tools provide the first indications of serious problems in the imaging data, and are therefore essential for testing DR1.

A production version of the spectroscopic 2D reduction code, idlspec2D v4_9, was developed and delivered in preparation for DR1 processing. The new version includes improved bias subtraction and flat-fielding, and improved masking of bad pixels. The code has been installed, tested, and run in the data processing factory.

A production version of the spectro 1D reduction code, spectro1D v5_7, was also developed and delivered in Q2 in preparation for DR1 processing. The new version includes an overhauled cross correlation template list, improvements to errors on line parameters, the addition of velocity dispersion code that is now output for early galaxy types, improved bookkeeping, and several small bug fixes. Finally, a new routine was implemented, "run_spectro_1d_plate", which runs directly off the spPlate files output by idlspec2d. The performance of the 1D pipeline was recently checked at Princeton, indicating that the rerun 15 success rate (classification and redshift determination) was greater than 99.5%. We expect this number to rise slightly with rerun 19.

4.2. Data Distribution

4.2.1. Use of the Early Data Release

A log of the maximum number of concurrent users each day is maintained on-line at: http://www-sdss.fnal.gov/sdssdp/sxstats/EDR/2002_Max_Concurrent_Users_by_Day. Usage was steady throughout the quarter.

4.2.2. Database Development Activities in Preparation for Data Release 1

During Q2, database work focused on developing the various tools needed to load the DR1 data into a Microsoft SQL Server database that will serve the data to the collaboration and astronomical community. These tools include file converters to convert FITS files into the comma-separated value (CSV) file format required for the SQL Server load; "loaders" to load the CSV files into a temporary database; "validators" to verify that the data in the temporary database is loaded correctly and that data values are within defined parameters; and "importers" to merge the data from the temporary database into the production database.

At the end of Q2, initial versions of the converters, loaders, and validators were under development with testing set to begin on a set of four imaging runs that we have named the DR1 Test Suite. A hardware test bed was assembled to support the test load, and a few data model and schema issues are being worked out. The initial loading of the test suite into a test database is scheduled for mid-July and will be performed largely by the software developers. Once the developers have refined the loading process, the code will be installed into the data processing operation at Fermilab and the operations staff trained in their use.

4.3. Data Processing and Distribution Goals for Q3

Overall, we are behind the baseline schedule for DR1. Finishing the development and validation of Photo v5_3 has taken much longer than expected. Through the validation process, a number of bugs have been found and fixed. We are close to declaring Photo v5_3 ready for production processing, pending a few final code changes and successful processing and validation of the test suite with the final code version. Validation of the test suite data is required before the full reprocessing of data for DR1 can begin.

We are also late in meeting milestones for developing the SQL Server databases. The plan called for the DR1 databases to be loaded by June, in order to give the collaboration ample time to analyze the data set, characterize its features in release notes, and shake down the database systems. We are currently several months behind this schedule and are taking measures to understand how to re-assign and focus resources in order to meet the DR1 release deadline.

The following set of goals has been established for Q3-2002:

1. Finish the testing and validation of Photo v5_3;
2. Process the DR1 data once pipeline testing is complete;
3. Complete the development and documentation of the software needed to load the DR1 data into the SQL Server database;
4. Integrate the SQL Server database tools into the production operation at Fermilab and train the production staff in their use;
5. Begin loading the SQL Server databases with imaging, spectro, tiling, and mask schema as the data is processed, so that is becomes available for collaboration testing as soon as possible;
6. Continue routine processing of data, especially to design plates for each tiling run;
7. Have data processing automated, and demonstrate that one FTE equivalent can run routine imaging and spectro processing, not including target/tile/plate and database stuffing operations

5. SURVEY PLANNING

5.1 Observing Aids

Several programs used to aid in observing were updated.

1. HoggPT is a program that processes the data from the Photometric Telescope in near real time and provides feedback on the photometric quality of a night. This program has remained essential unchanged.

2. Son-of-Spectro is a program that analyzes spectroscopic exposures in near-real time and determines if they have adequate signal/noise. This programs is continuously upgraded as various problems with the spectroscopic data are uncovered. Several small upgrades were made this quarter but no major new features were added.

3. The plate inventory database tracks which plates have been observed. The database now tracks "smear" exposures that are taken as part of the spectroscopic calibration process.

4. The patch database tracks the Photometric Telescope observing program. No changes were made.

Several programs are in various stages of development to aid in planning observations.

1. The plate layout program determines the exact parameters to be used for designing new plates. This program is relatively stable. No changes were made.

2. The plate planning program helps decide which areas of sky should be imaged next in order to maximize plate availability at all times during the night. No changes were made.

3. The plate design program was modified to aid the plate plugging technicians by fixing a problem with the code that groups fibers together in bundles of 20; in some cases the groups would overlap, which required the plugging techs to manually rearrange the groupings.

5.2 Target Selection

No changes were made to the target selection code or algorithms. There was one instance during the June dark run when new plates were not available during an hour in the middle of the night. Several old plates with low signal/noise data were made available for re-observing, and a couple were actually observed. New imaging data have since been processed and used to produce plates for this region.

101 plates were designed and drilled this quarter in three drilling runs.

A significant amount of work was done in Q2 in preparation of the fall observing program on the southern equatorial stripe. During the third quarter of 2001, we anticipated that we would exhaust the supply of regular survey plates in the region of the Southern Survey visible in June and July 2002. The process for soliciting proposals for spectroscopic surveys on the southern equatorial stripe was discussed in October 2001 at the SDSS collaboration meeting in Kyoto. In November, the Scientific Spokesperson issued the formal request for proposals to the collaboration and a total of 21 proposals were received. Shortly after receiving the proposals, the SDSS Director appointed a panel, chaired by the Project Scientist, to incorporate the proposals into a coherent fall observing plan. The panel retained those proposals that were in line with project goals and tailored the retained proposals to the available observing time. The Director also requested that a special advisory committee review the new fall observing plan. Since the fall 2002 observing season is rapidly approaching, a preliminary observing program unifying all of the tentatively approved proposals has been constructed and a first set of plates designed and drilled based on this plan.

6. COST REPORT

The operating budget that the Advisory Council approved in November 2001 for the year 2002 consists of $2,291K of in-kind contributions from Fermilab, US Naval Observatory (USNO), Los Alamos National Laboratory (LANL), and the Japan Participation Group (JPG); and $3,425K for ARC funded expenses.

Table 6.1 shows the actual cost performance by project area for ARC-funded cash expenses in Q2 2001. A more complete table comparing actual to baseline performance is included as an attachment to this report.

Table 6.1. ARC-Funded 2nd Quarter Expenses and Forecast for 2002 ($K)

	2002 – 2nd Quarter		2002 – Total	
Category	Baseline Budget	Actual Expenses	Baseline Budget (Nov 2001)	Current Forecast
1.1. Survey Management	45	58	249	250
1.2. Collaboration Affairs	4	1	16	41
1.3. Survey Operations				
1.3.1. Observing Systems	288	259	870	832
1.3.2. Data Processing & Dist.	175	138	641	599
1.3.3. Survey Coordination	0	0	0	0
1.3.4. Observatory Support	340	365	1,360	1,390
1.4. ARC Corporate Support	22	15	88	88
Sub-total	874	837	3,225	3,200
1.5. Management Reserve	50	0	200	140
Total	924	837	3,425	3,340

6.1 First Quarter Adjustments

ARC-funded 2002-Q1 expenses have been adjusted from that reported in the Q1 report to reflect revised costs reported by several institutions. Actual Q1 expenses decreased by $46K, due to unrealized encumbrances in the Observatory Support account that had been included with actual expenses. These unrealized encumbrances have been moved forward into Q2. Minor adjustments on several other accounts tended to cancel each other out.

A slight adjustment has also been made in the value of in-kind contributions for Q1. The reported value of the in-kind contribution decreased by $28K to correct an error in the way that Los Alamos National Laboratory in-kind salary costs were reported.

6.2 Second Quarter Performance - In-kind Contributions

The sum of in-kind contributions for the second quarter was $499K against the baseline forecast of $576K, and was provided by Fermilab, Los Alamos, the U.S. Naval Observatory (USNO), and the Japan Participation Group (JPG).

Fermilab provided support for the data acquisition system at APO, the software programs used by the observers to operate the telescopes and instruments, and the data processing systems at Fermilab as agreed. As forecast in the Q1 report, the level of in-kind Observing Systems Support in Q2 was less than predicted when the budget was prepared, because resources at Fermilab were not available to support SDSS at the level anticipated. The forecast for Q3-Q4 has been adjusted to reflect the reduction in level of effort anticipated through the end of 2002.

Los Alamos provided programming support for the Telescope Performance Monitor, and substantial testing support in preparation of Data Release 1. As a result of the increased involvement, the level of in-kind support provided in Q2 exceeded the forecast prepared in November 2001.

USNO provided support as required for the astrometric pipeline and other software systems they maintain. Q2 activities focused on quality assurance testing and support in preparation of DR1. The level of in-kind support reported for Q2 is a preliminary estimate and will be revised when actual numbers become available.

No in-kind support was provided by the JPG in Q2, because no support was required for the imaging camera filters or calibration system. In fact, the anticipated level of effort required for the remainder of 2002 will be substantially less than earlier forecast. The Q3-Q4 forecast has been revised accordingly.

6.3. Second Quarter Performance – ARC Funded Expenses

The sum of ARC-funded expenses for the first quarter was $837K, which is $37K below the first-quarter budget of $874K.

Survey management costs as a whole were $13K above the Q2 baseline. Travel expenses related to the Office of the Project Scientist were lower than anticipated. The Fermilab survey management account appears overspent because some of the Project Spokesperson's travel was arranged and billed through the survey management account, and because expenses incurred by Fermilab for SDSS teleconferences were charged to ARC. These costs were not included in the 2002 baseline budget, therefore they will be covered through the use of management reserve funds as described in section 6.4. Lastly, the Q2 budget for ARC Support for Public Affairs appears overspent for two reasons. First, AAS meeting costs that had been budgeted in Q1 were realized in Q2. Second, a new SDSS conference display booth was purchased in Q2 for the June AAS meeting; the upgrade had been budgeted for in Q3. Since the costs for both the AAS meeting and the new display were included in the 2002 budget, the overall forecast for public affairs remains unchanged for the year. Likewise, the sum of all survey management costs are forecast to be within $1K (0%) of the baseline budget for the year.

The budget for Collaboration Affairs provides for Working Group travel and technical page charges and is held in an ARC corporate account. Since there were only modest travel expenses and no page charges in Q2, actual costs to date are below the baseline forecast. The surplus has been moved forward into the remaining two quarters.

Observing Systems costs were $29K below the second quarter budget for several reasons. Some engineering projects were completed below their initial cost estimates, some projects were delayed due to resource availability, and projects such as the APO cart storage shed were cancelled so the funds could be allocated elsewhere. In addition, the cost of remaining thermal improvement tasks was lower than anticipated. We believe that with the installation of ventilation louvers in the lower level of the telescope enclosure, there is no need for further thermal improvements. For the year, the total Observing Systems forecast is $38K (4%) below the baseline budget.

Data Processing and Distribution costs appear to be $37K below the Q2 budget. Fermilab and University of Chicago expenses were within a few thousand dollars of the allocated budgets. Princeton expenses were $8K below the budget due to lower than anticipated salary, travel, and computer support costs. JHU expenses associated with data archive development and support appear to be $30K below the Q2 budget, but this is because some salary costs were not reported when the SSP37 Q2 expenses were submitted. The Q2 numbers will be revised to reflect actual costs once all salary costs are properly included. JHU expenses associated with software testing and validation are also estimated and will be revised when actual expenses are reported. For the year, the Data Processing and Distribution forecast is $42K (7%) below the baseline budget, but this is likely to increase when the JHU expenses are corrected.

Observatory Support costs were $25K above the baseline budget for Q2. The Observatory Support budget appears overspent because in addition to planned Q2 expenses, it includes obligations made in Q1 but costed in Q2, and obligations made in Q2 that will be costed in Q3 or Q4. NMSU is considering changes in the reporting method to separate out obligations from expenses, which will simplify the reporting process. With regard to Q2 expenses, salary costs during the quarter were above average (27%) because of the increased overtime required on long observing nights. The spend rate for the existing staff will abate somewhat in Q3 and Q4, due in part to the scheduled summer shutdown and shorter fall nights. In June, the Advisory Council approved a plan to add an eighth observer, which will increase salary and travel costs once the eighth observer is on board. To cover the additional cost, the Q4 forecast has been augmented with funds allocated from the management reserve, as described in section 6.4. With this addition, the Observatory Support budget is forecast to be within 2% of the baseline budget.

ARC Corporate Support costs were $7K below the Q2 budget, and included anticipated expenses for audit services, bank fees, and petty cash outlays. Funds were set aside in the ARC Corporate Support budget for periodic readiness reviews, but since no review was held in the spring, these funds have been moved forward. For the year, the forecast for ARC Corporate Support expenses is equal to the baseline budget.

6.4 Management Reserve

It became evident during the first half of 2002 that a number of items not included in the baseline budget would need to be funded through the allocation of management reserve. These items, with estimated costs, are listed in Table 6.2.

Table 6.2. Allocation of 2002 Management Reserve Funds.

Item	Estimated Cost ($K)
8th Observer at APO	21
Observers Research Fund	12
Larger Trailers for Engineers and Observers	68
Survey Management Teleconference Charges	24
Part-time Public Information Officer	25
LAMOST collaboration support	9
Total	159

The addition of an eighth observer and the establishment of the Observers Research Fund are part of the close-out plan for the survey. One of the key recommendations from the November 2001 Operations Efficiency Review was that survey management develop a strategy for closing out the project. A critical component of the closeout strategy was the need to retain key personnel, especially for telescope operations, until observing is complete. Closely related is the importance of developing and maintaining the scientific expertise of the observing staff, nearly all of whom are PhD-level astronomers. The addition of an eighth observer will make available approximately 5 hours of research time per week per observer, which allows the observers to collaborate on science projects utilizing SDSS data with scientists and mentors at the participating institutions. SDSS project management anticipates that this will also provide an important level of quality assurance for the SDSS data. The Observers Research Fund will cover the travel expenses associated with this effort.

Another major recommendation of the Operations Review was that the working space for the engineering and observing staffs at APO be improved. A project is underway to install significantly larger office trailers at APO for these two groups. However, site preparation costs are significantly higher than the preliminary estimates used to prepare the baseline budget. Management reserve funds are required to cover the increased cost of the office space upgrade.

In past years, SDSS teleconference expenses were provided by Fermilab as in in-kind contribution. Given the geographical dispersion of the participating institutions, teleconferences are a necessary tool for planning and coordinating engineering, observing software, data processing software, and survey operations activities. Teleconferences are also being used to plan and track DR1 work activities. Late in 2001, Fermilab requested reimbursement for teleconference charges, retroactive to October 1, 2001. Since these costs were not included in the baseline budget prepared in November 2001, management reserve funds are required to cover this added expense.

A part-time Public Information Officer has been hired to provide a professional point-of-contact for public information. In addition to preparing and coordinating press releases, this individual will be involved in developing content for the SDSS web site, developing connections through SkyServer outreach, and providing leadership for the involvement of public information officers at the participating institutions. Since this position was created after the 2002 budget was prepared, management reserve funds are required to cover salary and travel expenses.

A collaboration is being established between the SDSS and the Large Aperture Multiple Object Spectrographic Telescope project (LAMOST) to share technical knowledge and participate in joint science projects. The proposed collaboration will proceed in three phases. During the first phase, a pilot project for future phases, LAMOST will provide the SDSS with two scientists who will work on SDSS systems relevant to LAMOST. They will carry lessons learned back to the LAMOST project and will help with SDSS projects. One scientist will be stationed at APO and will assist with spectroscopic operations and quality testing of spectroscopic data; the second will be stationed at Fermilab and will assist with data processing operations and quality testing of the processed spectroscopic data. The SDSS will support the two LAMOST scientists by covering their expenses in the United States. LAMOST will pay travel costs to and from Beijing. Early in June, the Advisory Council approved the use of management reserve funds for the first phase. In mid-June, John Peoples and Don York met with William Chang, of the NSF International Affairs Division, to discuss their plan to submit a proposal to the NSF for LAMOST-SDSS collaborative work in the U.S. in FY2004 and FY2005. Don York will prepare a proposal for ARC consideration in October 2002. If ARC approves the proposal, it will be formally submitted to the NSF. The LAMOST project also plans to submit a proposal for collaborative work in China to the Chinese Academy of Science.

The aforementioned items were carefully reviewed and approved by the SDSS Management Committee, and can be accommodated by using $160K of the $200K management reserve in the approved budget. However, $40K is too small of a management reserve at this point in the year and so the SDSS Director has requested that the ARC-funded budget be increased by $100K, which will increase the management reserve to $140K as shown in the current forecast. The request is currently under consideration by the SDSS Advisory Council.

7. Publications in Q2

"Two-Dimensional Topology of the Sloan Digital Sky Survey", ApJ submitted, Fiona Hoyle, et al.

"The Cluster Mass Function from Early SDSS Data: Cosmological Implications", ApJ submitted, Neta A. Bahcall, et al.

"The Redshift of the Lensing Galaxy in PKS J0134-0931", ApJL submitted, Pat Hall, et al.

"SDSS 0924+0219: an Interesting "Three Component" Gravitationally Lensed Quasar", AJ submitted, Naohisa Inada, et al.

"SDSS 1226$-$0006: A Gravitationally Lensed Quasar Candidate from the Sloan Digital Sky Survey", AJ submitted, Naohisa Inada, et al.

"Estimating Fixed Frame Galaxy Magnitudes in the SDSS", AJ submitted – Michael R. Blanton, et al.

"Astrometric Calibration of the Sloan Digital Sky Survey", AJ submitted – Jeffrey R. Pier

"The Application of Photometric Redshifts to the SDSS Early Data Release", AJ submitted, Istvan Csabai, et al.

"Kinematic study of the disrupting globular cluster Palomar 5 using VLT spectra", AJ accepted – M. Odenkirchen, et al

"The Dependence of Star Formation History and Internal Structure on Stellar Mass for 80,000 Low Redshift Galaxies", MNRAS submitted – Guinevere Kauffmann, et al

"Galaxy Star-Formation as a function of Environment in the Early Data Release of the Sloan Digital Sky Survey", P Gomez, et al

"The Sloan Digital Sky Survey Moving Object Catalog", Z. Ivezic, et al.

"A feature at z ~ 3.3 in the evolution of the Ly-alpha optical depth", AJ submitted, M. Bernardi, et al.

" The Luminosity Density of Red Galaxies", AJ accepted , D. Hogg, et al

“Faint High Latitude Carbon Stars Discovered by the SDSS: Methods and Initial Results”, AJ accepted, B. Margon, et al.

“Color Confirmation of Asteroid Families”, Nature submitted, Zeljko Ivezic, et al.

“Stellar Masses and Star Formation Histories for 80,000 Galaxies from the Sloan Digital Sky Survey”, MNRAS submitted, Guinevere Kauffmann, et al.

“Cluster detection from surface-brightness fluctuations in SDSS data”, Astronomy & Astrophysics submitted, Matthias Bartelmann, et al.

“Cosmological Information from Quasar-Galaxy Correlations induced by Weak Lensing”, Astronomy & Astrophysics submitted, Brice Menard, et al.

The following publications are based on public SDSS data:

“Constraining the Redshft z-6 Quasar Luminosity Function Using Gravitational Lensing”, ApJ submitted, Zoltan Haiman

“Detection of He II reionizastion in the SDSS quasar sample”, ApJL accepted, T. Theuns, et al.

“A Constraint on Gravitational Lensing Magnification and Age of the Redshft z-6.28 Quasar SDSS 1030+0524”, ApJL submitted, Zoltan Haiman

“A Physical Model for the luminosity of High-Redshift Quasars”, ApJ submitted, Stuart Wyithe and Abraham Loeb

“Morphological Butcher-Oemler effect in the SDSS Cut & Enhance Galaxy Cluster Catalog”, PSAJ submitted, Tomo Goto, et al.

“SDSS Survey for Resolved Milky Way Satellite Galaxies II: High Velocity Clouds in the EDR”, AJ submitted, Beth Willman, et al.

“The Sloan Digital Sky Survey”, Contemporary Physics accepted, Jon Loveday, et al.

“Broad Emission Line Shifts in Quasars: An Orientation Measure for Radio-Quiet Quasars?”, AJ in press, Gordon T. Richards, et al.

“Large Scale Structure in the SDSS Galaxy Survey”, MNRAS submitted, Andrei Doroshkevich, et al.

“Revision of the selection function of the Optical Redshift Survey using the Sloan Digital Sky Survey: Early Data Release”, PASJ submitted – Hiroyuki Yoshiguchi, et al.

“Stellar-Mass Black Holes in the Solar Neighborhood”, ApJ submitted – James Chisholm, et al.

"The Pairwise Velocity Distribution Function of Galaxies in the LCRS, 2dF, and SDSS Redshift Surveys", ApJL accepted, Stephen D. Landy

"The Shapes of Galaxies in the Sloan Digital Sky Survey", AJ accepted, S. M. Khairul Alam, et al.